

Appendix A

Activities in California and Other States

Addendum to Breakthrough Technologies Institute's
*State Activities That Promote Fuel Cells
and Hydrogen Infrastructure Development*
Report of April 2006

Addendum compiled November 14, 2006
by Energy Independence Now

The following is a listing of additions to BTI's April 2006 report. Many of these additions are a result of the event occurring after the BTI report was published; the BTI's omission of university programs; or other events not included in the original report.

- **Alabama**
 - University of Alabama – Birmingham and Birmingham-Jefferson County Transit Authority Hydrogen-Hybrid Bus Demonstration Project. Recipient of \$5.6m US DOT award to develop 35-foot, 37-seat hybrid hydrogen bus. 3-year project includes one year for building vehicle and 2 years demonstrating it in Birmingham, Columbia, SC, and Connecticut.ⁱ
- **Arizona**
 - Demonstration
 - Solar Thermochemical Hydrogen Production Demonstration - In 2004, Solar Hydrogen Energy Corp. of Canada demonstrated solar thermochemical production of hydrogen using Arizona Public Services' Tempe solar array.ⁱⁱ
 - University
 - Arizona State University - Biodesign Institute received \$1.5m US DOE for electrolysis catalyst researchⁱⁱⁱ
- **Arkansas**
 - University
 - University of Arkansas-Little Rock Nanotechnology Center of Excellence - Recipient of \$1.4m to support hydrogen and solar energy technology research as part of the federal FY06 Energy and Water Appropriations Bill.^{iv}
- **Colorado**
 - Research
 - Xcel Energy and NREL signed cooperative research agreement in May of 2006 to research hydrogen from wind and grid sources.^v
 - University
 - Colorado School of Mines
 - Recipient of a portion of a 5-year, \$1.5m US DOE grant to conduct polymer membrane research.^{vi}

- **Connecticut**
 - Demonstration
 - Greater New Haven Transit District Advanced Hydrogen Fuel Transportation System Development Program – Partnership of GNHTD, NREL, OEMs to demonstrate 2 hydrogen-powered buses using Federal Transit Authority award funds. One bus is a battery dominant, hybrid-fuel cell, the other a hydrogen ICE. Both will use hydrogen produced via steam-methane reformation and compressor-less electrolysis^{vii}
- **Delaware**
 - University
 - Delaware State University - Center for Hydrogen Storage Research – Received \$500,000 federal research grant in July 2006.^{viii}
- **Florida**
 - 2006 Florida Energy Act - \$30m 4-year suite of rebates, grants, and tax incentives for renewables, biofuels, and hydrogen to create a balanced energy portfolio. Includes \$5m in sales tax exemptions and corporate income tax credits for hydrogen vehicles and fueling stations, and \$2.5m for stationary fuel cells^{ix}
 - University
 - Seven active programs at University of Florida, University of Central Florida, University of South Florida, Florida State University, Florida A&M, University of Miami, Florida International University, and University of West Florida^{xxi}. University of Central Florida recipient of \$7.4m NASA grant to fund hydrogen work at UCF's Florida Solar Energy Center. Grant is a part of 4-year \$30m NASA project.^{xii}
- **Georgia**
 - University
 - University of Georgia - Athens
 - Recipient of US DOE funds totaling \$1.35m to be shared with UC-Santa Cruz to research nanoscale solar hydrogen production and nanotube hydrogen storage.^{xiii}
 - Georgia Tech
 - Strategic Energy Institute recipient of \$12m/5year grant from Chevron Technology Ventures to study next-generation hydrogen-powered transition technologies.^{xiv}
- **Idaho**
 - Demonstration
 - Idaho Synthetic Energy, Inc. - Received US Dept. of Energy grant to aid in the construction of a wind/grid-electrolysis hydrogen generation plant in Boise.^{xv}

- **Illinois**
 - City of Chicago Ethanol-to-Hydrogen Station - Announced 11/9/05, it is world's first ethanol-to-hydrogen demonstration station. \$2 million stipend funded by federal energy and water appropriations bill. Break ground in 2006. Station will fuel test-fleet of 5 hydrogen vehicles.^{xvi}
- **Indiana**
 - Demonstration
 - Hydrogen-from-waste production plant - Being built in DeKalb county by ForeverGreen Industries with \$4.75 million in funding from state's Indiana Economic Development Corporation. Will create an estimated 150+ jobs. Construction to be completed mid-2006.^{xvii}
 - University
 - Purdue Energy Center at Discovery Park: "a multidisciplinary academic community of over 75 researchers, scientists, engineers and economists formed to interact with and significantly contribute to the energy solutions the states, nations, and the world are currently seeking."^{xviii}
- **Louisiana**
 - University
 - Louisiana State University – Baton Rouge - Recipient of \$4.6m grant from US Department of Energy and ConocoPhillips to develop coal-to-hydrogen. Project partners include Clemson University and Oak Ridge National Laboratory.^{xix}
- **Massachusetts**
 - Massachusetts Fuel Cell Partnership - Created as part of MA House of Representatives omnibus legislation by State Rep. Barry Finegold (D-Andover).^{xx} "This intends to accelerate the development and deployment of commercially viable fuel cell and related hydrogen production. The partnership calls for growth and development of a fuel cell industry cluster in the Commonwealth...One of the goals of the Partnership is to leverage federal research and funding sources to improve the competitiveness of Massachusetts entities."^{xxi}
 - Demonstration
 - Boston Logan International Airport Fuel Cell Bus and Refueling Demonstration Program - Nuvera Fuel Cells recipient of \$4.9m award from US DOT's Federal Transit Authority grant. Convert existing shuttle bus to fuel cell and construct hydrogen refueling station at airport. Will be just second hydrogen station in New England.^{xxii}
- **Michigan**
 - University
 - University of Michigan - "The University of Michigan is designing three new hydrogen and fuel cell technology programs to advance Alternative Energy Technology (AET) education in the State of

Michigan. Our long term goal is to design, develop, market and implement Hydrogen Technology concentrations for most of our B.S.E. degrees, an Interdisciplinary Professional Program (InterPro) in Hydrogen Technology, and a continuing education certificate program in Fuel Cell Technology.^{xxiii}

- Kettering University - "...securing state and federal funding for a new \$2.7m building that would house a fuel cell research laboratory for Delphi and offer space for other emerging technology companies...Kettering already focuses heavily on the research end of fuel cells in its new Center for Fuel Cell Systems & Powertrain Integration."^{xxiv} Received \$1.62m from US Dept. of Commerce in December 2005^{xxv}
- Southwestern Michigan College – Developing fuel cell motorcycle^{xxvi}
- Michigan Tech - MT Institute of Materials Processing received \$1.7m from US DOE for metal hydride research^{xxvii}
- Lawrence Technical University - Partner with DTE on H2 Technology Park^{xxviii}

- Demonstration

- EPA/DaimlerChrysler/Air Products/UPS Fuel Cell Vehicle Initiative – Air Products designed/built hydrogen station to fuel D/C UPS delivery vans. Station based at US EPA National Vehicle and Fuel Emission Laboratory in Ann Arbor. First commercial fleet to use hydrogen in normal business application.^{xxix}

- **Montana**

- University

- Montana State University - Conducting research into production of hydrogen from proteins and ethanol based sources.^{xxx}

- **Nevada**

- Federal funds awarded to state in 2005 Appropriations bill: Solar hydrogen (UNLV) - \$4m, fuel cell R&D (UNLV) - \$4m, hydrogen fuel cell bus project (Washoe RTC) - \$3m (see below), renewable hydrogen fueling station (UNLV) - \$3m, photoelectric chemical production of hydrogen (UNLV) - \$3m, photoelectrochemical production of hydrogen (UNR) - \$5m^{xxxi}

- Demonstration

- Washoe RTC (Regional Transportation Commission) hydrogen bus program. Funding received from federal award (see above), but project not expected to start until 2011.^{xxxii}

- University

- UNLV- Receiving state and federal funds for solar-hydrogen research program^{xxxiii} (see above). Developing solar-hydrogen fueling station^{xxxiv}. Advanced research on hydrogen ICEs.^{xxxv}
- UN – Reno – Awarded \$5m of federal funds for photoelectrochemical production of hydrogen^{xxxvi}

- **New Mexico**

- Hydrogen Energy Liability Insurance Program (House Memorial 29)^{xxxvii} – New Mexico Hydrogen Business Council previewed 2007 legislative request for creation of state-run liability insurance provider for hydrogen and fuel cell researchers.^{xxxviii} Instructs the legislature and the NMHBC to convene an interim committee to discuss forming an insurance program.^{xxxix}
- University
 - New Mexico State University - Working on fuel cell materials science^{xl}
 - University of New Mexico - Received \$3.5m Department of Defense grant to research enzymatic fuel cells^{xli}
- **New York**
 - 2007 State Budget Proposal - Governor Pataki's 2007 state budget proposal includes: Elimination of taxes on fuel from renewable sources, \$5 million to develop hydrogen vehicles, \$5 million to create renewable fuel stations, \$10 million to research advanced car components, \$24 million for alternative fuel vehicle research lab in Malta, NY, Empire Zones: tax-free areas for clean energy companies.^{xlii}
 - Demonstration
 - GM/Shell Fueling Stations
 - Greenburgh Alternative Energy Project. Resuming plans to convert a Shell station's pump to dispense hydrogen for GM vehicles. Site would be at 1000 Central Park Avenue, Scarsdale, NY. Grid electrolysis, 35 kg storage. Cost under \$1m.^{xliii}
 - White Plains Fueling Station. To be built at city's Kensico Avenue garage to refuel 2 GM and 3 Toyota cars. City applied for \$324,000 grant from state for vehicle purchase. Fuel to be donated by Shell.^{xliv}
 - Buffalo Hydrogen Project - American Wind Power & Hydrogen LLC received \$709k to convert ICEs at University of Buffalo and Niagara Frontier Transit Authority. Fueling station built by Praxair and Tonawanda supply the hydrogen.^{xlv} NYSERDA awarded 2 modified hydrogen Toyota Prius to University of Buffalo for project.^{xlvi}
- **North Dakota**
 - University
 - University of North Dakota - Energy & Environmental Research Center (EERC) - Recipient of \$2.5m from ND Centers of Excellence Commission to build new facility for EERC's/US DOE's National Center for Hydrogen Technology (NCHT), dedicated to hydrogen and fuel cell commercialization. Startup funding for facility collected by US Sen. Byron Dorgan with contributions from Air Products, Chippewa Valley Ethanol, Basin Electric Power Cooperative, ePower Synergies, Hydrogenics, IdaTech, Pratt &

Whitney Rocketdyne, SGL Carbon, Schunk-INEX, Siemens, and Xcel Energy.^{xlvi}

- Also received \$2.7m US DOE award in June 2005 to research hydrogen-from-coal. It is a one-year cooperative research program between UND and DOE's National Energy Technology Laboratory (NETL). Industry contributing \$700k to program to bring total first year funding to \$3.4m.^{xlvi}
- North Dakota State University - Wind-electrolysis hydrogen fueling station commissioned by Basin Electric Power Cooperative being installed at NDSU's Central Research Extension Center by Hydrogenics Corporation. Project co-sponsored by US DOE's Wind Hydrogen Program. To open Q3 2006.^{xli} Program partners: Basin Electric Power Cooperative, Hydrogenics, Office of US Senator Byron Dorgan, NDSU, Verendrye Electric Power Cooperative, UND EERC.
- **Oregon**
 - Governor Ted Kulongoski recently expressed strong support for hydrogen technology and directed Oregon Department of Energy to develop strategies for move to hydrogen economy. Proposed increasing Business Energy Tax Credit from 35% to 50% and allow hydrogen from renewables to qualify.ⁱ
 - University
 - Oregon State University - Department of Bioengineering - Receiving \$900k US DOE grant for three years to research hydrogen production using photosynthetic cyanobacteria tolerant of oxygen.ⁱⁱ
- **Pennsylvania**
 - Hydrogen-Shuttle Bus Demonstration Program - 2 Ford H2 ICE buses: one at Air Products' Trexlertown HQ, second at DaVinci Discovery Center of Science and Technology in South Whitehall Township. Both will refuel at Air Products. Program is funded \$1.8m from the \$286b Congressional Transportation bill.ⁱⁱⁱ
- **Tennessee**
 - Chattanooga Area Rapid Transit Authority (CARTA) – To receive fuel cell shuttle bus by December. Receiving \$1m from Fed. Transit Admin. Fuel supplied by General Hydrogen of Gallatin, TN.^{liii} In October '06, received additional \$1.65m for next phase of project. Additional \$500k pending in US Congress, being championed by Rep. Zack Wamp (R).^{liv}
 - University
 - University of Tennessee - Received \$1.5m US DOE grant to conduct research on high-temp, low-humidity fuel cell membranes^{lv}

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